

The invention claimed is:

1. A method for measuring the concentration, in a bodymaker coolant that has a pH value greater than 3.0, of a bodymaker-lubricant-as-prepared that includes a boric acid-amine complex, said method comprising operations of:

5 (I) providing a representative sample of the bodymaker coolant, said representative sample having a total boron content and a precisely known size and being either inherently liquid or dissolved in a solvent to form a liquid solution that contains all of the boron content of the representative sample;

10 (II) mixing with the representative sample of the bodymaker coolant provided in step (I) a sufficient amount of an interference-preventing-acidulant to form a first mixture with a pH value below 3.0, said interference-preventing-acidulant comprising molecules of:

15 (A) at least one carboxylic acid having a water solubility of at least 1.0 % and at least two carboxyl moieties (i.e., -COOH moieties) per molecule; and, optionally, one or both of the following components:

20 (B) at least one organic substance that does not include at least two carboxyl moieties per molecule but does include in each molecule at least two total moieties selected from the group consisting of nitrogen atoms that are not tetravalently bonded to any other atoms, phosphorus atoms that are not tetravalently bonded to any other atoms, sulfur atoms that are not hexavalently bonded to any other atoms, hydroxyl moieties that are not part of carboxyl moieties, and ether moieties; and

25 (C) water;

25 (III) mixing with the first mixture formed in step (II) a sufficient amount of at least one alkali metal or alkaline earth metal hydroxide to form a second mixture having a pH value that is known within 0.1 pH unit and is in a range from 4.0 to 9.0;

30 (IV) mixing a total amount of a neutral boric-acid-freeing-substance with the second mixture formed in step (III), so as to form a third mixture having a pH value, said neutral boric-acid-freeing-substance being selected from the group consisting of organic substances that (i) contain no carboxylate or other acid moieties but do include at least three hydroxyl moieties in each molecule and (ii) are soluble in water to an extent of at least 1.0 %, said total amount of neutral boric-acid-freeing-substance having both of the following properties:

35 (1) the pH value of the third mixture is at least 0.5 pH unit lower than the pH value of said second mixture; and

(2) if an additional amount of said neutral boric-acid-freeing-substance that is at least 5 % of said total amount of neutral boric-acid-freeing-substance is added

to the third mixture so as to make a test mixture, the test mixture has a pH value that does not differ by more than 0.1 pH unit from the pH value of the third mixture;

5 (V) mixing with said third mixture a precisely known sufficient number of moles of hydroxide ions that are soluble in said third mixture, so as to form a fourth mixture having a pH value that differs by not more than 0.1 pH unit from the pH of said second mixture, said precisely known sufficient number of moles of hydroxide ions having the property that, if a precisely known trial number of moles of hydroxide ions that are soluble in said third mixture, said trial number of moles being smaller than said sufficient number of moles by an amount that is at least 2.0 % of the sufficient number of moles, had been mixed with said third mixture instead of the sufficient number of moles, so as to form a trial fourth mixture, the trial fourth mixture would have had a pH value that was lower than the pH value of said second mixture by more than 0.1 pH unit; and

10 (VI) calculating a content in grams of boron in said representative sample of bodymaker coolant by multiplying the sufficient number of moles of hydroxide ions mixed in step (V) by 10.8 to generate the content in grams of boron in said representative sample and calculating the concentration of bodymaker-lubricant-as-prepared in the bodymaker coolant from the calculated content in grams of boron in said representative sample, the precisely known concentration of boron in the bodymaker-lubricant-as-prepared, and the precisely known size of the representative sample,

15 the term "precisely measured" in the description above meaning measured in such a manner that there is a probability of at least 95 % that three consecutive measurements made in said manner for the same quantity will have a standard deviation from a mean of the three measurements that is not more than 10 % of said mean and the term "precisely known" in the description above meaning known within a precision of 10 % of the value of any specified quantitative property of a tangible material to which the term is applied, or of a value calculated from use of a non-tangible mathematical function or formula to which the term is applied.

20 2. A method according to claim 1, wherein component (A) of the interference-preventing-acidulant is selected from the group consisting of carboxylic acids that:

25 - also contain hydroxyl moieties that are not part of the carboxyl moieties; and

30 - have not more than 8 carbon atoms per molecule.

35 3. A method according to claim 2, wherein the neutral boric-acid-freeing-substance in operation (IV) is selected from the group consisting of mannitol, glycerol, and sucrose.

4. A method according to claim 3, wherein, in operation (III), the final pH value is at least 6.5.

5. A method according to claim 4, wherein operation (V) is performed by titration of the third mixture with a standard solution of hydroxide ions.

5 6. A method according to claim 1, wherein the neutral boric-acid-freeing-substance in operation (IV) is selected from the group consisting of mannitol, glycerol, and sucrose.

7. A method according to claim 6, wherein, in operation (III), the final pH value is at least 6.5.

10 8. A method according to claim 7, wherein operation (V) is performed by titration of the third mixture with a standard solution of hydroxide ions.

9. A method according to claim 1, wherein, in operation (III), the final pH value is at least 6.5.

15 10. A method according to claim 9, wherein operation (V) is performed by titration of the third mixture with a standard solution of hydroxide ions.

15 11. A method according to claim 1, wherein operation (V) is performed by titration of the third mixture with a standard solution of hydroxide ions.

12. A method according to claim 1, wherein:

20 - component (A) is citric acid;

- in operation (III), the final pH value is from about 7.1 to about 8.2; and

- the neutral boric-acid-freeing-substance utilized in operation (IV) is mannitol.

25 13. A method according to claim 12, wherein the bodymaker-lubricant-as-prepared includes a magnesium containing biocide and the interference-preventing-acidulant additionally comprises a component (B) that is selected from the group consisting of molecules that each contain two distinct moieties selected from the group consisting of hydroxyl, ether, and non-tetravalently bonded nitrogen moieties, these two distinct moieties being bonded so that there are exactly two or three carbon atoms in the shortest continuously bonded chain between the nitrogen or oxygen atoms in each of the distinct moieties.

30 14. A method according to claim 13, wherein component (B) is 8-hydroxyquinoline and is present in an amount that has a ratio within the range from about 0.080:1.0 to about 0.15:1.0 to the amount of component (A) present in the same interference-preventing-acidulant.

15. A method according to claim 1, wherein the bodymaker-lubricant-as-prepared includes a magnesium containing biocide and the interference-preventing-acidulant

5 additionally comprises a component (B) that is selected from the group consisting of molecules that each contain two distinct moieties selected from the group consisting of hydroxyl, ether, and non-tetravalently bonded nitrogen moieties, these two distinct moieties being bonded so that there are exactly two or three carbon atoms in the shortest continuously bonded chain between the nitrogen or oxygen atoms in each of the distinct moieties.

10 16. A method according to claim 15, wherein component (B) is 8-hydroxyquinoline and is present in an amount that has a ratio within the range from about 0.03:1.0 to about 0.7:1.0 to the amount of component (A) present in the same interference-preventing-acidulant.

15 17. A composition of matter useful as an interference-preventing-acidulant in a method according to claim 1, said composition consisting essentially of the following components:
(A) at least one carboxylic acid having a water solubility of at least 1.0 % and at least two carboxyl moieties per molecule; and
(B) at least one organic substance that does not include at least two carboxyl moieties per molecule but does include in each molecule at least two total moieties selected from the group consisting of nitrogen atoms that are not tetrahedrally bonded to any other atoms, phosphorus atoms that are not tetrahedrally bonded to any other atoms, sulfur atoms that are not hexavalently bonded to any other atoms, hydroxyl 20 moieties that are not part of carboxyl moieties, and ether moieties; and, optionally, (C) water,

the mass of component (B) in the composition having a ratio to the mass of component (A) in the same composition that is from about 0.03:1.0 to about 0.7:1.0.

18. A composition according to claim 17, wherein:
25 - component (A) is selected from the group consisting of carboxylic acids that:
-- also contain hydroxyl moieties that are not part of the carboxyl moieties; and
-- have not more than 8 carbon atoms per molecule; and
- component (B) is selected from the group consisting of molecules that each contain two distinct moieties selected from the group consisting of hydroxyl, ether, and non-tetrahedrally bonded nitrogen moieties, these two distinct moieties being bonded so 30 that there are exactly two or three carbon atoms in the shortest continuously bonded chain between the nitrogen or oxygen atoms in each of the distinct moieties; and
- the mass of component (B) in the composition has a ratio to the mass of component (A) in the same composition that is from about 0.05:1.0 to about 0.3:1.0.
35 19. A composition according to claim 18, wherein:
- component (A) is selected from the group consisting of malic acid, tartaric acid, and

citric acid;

- component (B) is selected from the group consisting of ethylene glycol, propylene glycol, ethylene diamine, propylene diamine, ethanol amine, propanol amine, and 8-hydroxyquinoline; and

5 - the mass of component (B) in the composition has a ratio to the mass of component (A) in the same composition that is from about 0.080:1.0 to about 0.20:1.0.

20. A composition according to claim 19, wherein:

- component (A) is citric acid;
- component (B) is 8-hydroxyquinoline; and

10 - the mass of component (B) in the composition has a ratio to the mass of component (A) in the same composition that is from about 0.090:1.0 to about 0.11:1.0.